

TB-FMCL-AUDIO Hardware User Manual

Rev.1.00

Revision History

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Introduction

Thank you for purchasing the **TB-FMCL-AUDIO** board. Before using the product, be sure to carefully read this user manual and fully understand how to correctly use the product. First read through this manual then always keep it handy.

SAFETY PRECAUTIONS

Observe the instructions

Observe the precautions listed below to prevent injuries to you or other personnel or damage to property.

- Before using the product, read these safety precautions carefully to assure correct use.
- These precautions contain serious safety instructions that must be observed.
- After reading through this manual, be sure to always keep it handy.

The following conventions are used to indicate the possibility of injury/damage and classify precautions if the product is handled incorrectly.

 Danger	Indicates the high possibility of serious injury or death if the product is handled incorrectly.
 Warning	Indicates the possibility of serious injury or death if the product is handled incorrectly.
 Caution	Indicates the possibility of injury or physical damage in connection with houses or household goods if the product is handled incorrectly.

The following graphical symbols are used to indicate and classify precautions in this manual.
(Examples)

	Turn off the power switch.
	Do not disassemble the product.
	Do not attempt this.



Warning

	In the event of a failure, disconnect the power supply. If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately and contact our sales personnel for repair.
	If an unpleasant smell or smoking occurs, disconnect the power supply. If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately. After verifying that no smoking is observed, contact our sales personnel for repair.
	Do not disassemble, repair or modify the product. Otherwise, a fire or electric shock may occur due to a short circuit or heat generation. For inspection, modification or repair, contact our sales personnel.
	Do not touch a cooling fan. As a cooling fan rotates in high speed, do not put your hand close to it. Otherwise, it may cause injury to persons. Never touch a rotating cooling fan.
	Do not place the product on unstable locations. Otherwise, it may drop or fall, resulting in injury to persons or failure.
	If the product is dropped or damaged, do not use it as is. Otherwise, a fire or electric shock may occur.
	Do not touch the product with a metallic object. Otherwise, a fire or electric shock may occur.
	Do not place the product in dusty or humid locations or where water may splash. Otherwise, a fire or electric shock may occur.
	Do not get the product wet or touch it with a wet hand. Otherwise, the product may break down or it may cause a fire, smoking or electric shock.
	Do not touch a connector on the product (gold-plated portion). Otherwise, the surface of a connector may be contaminated with sweat or skin oil, resulting in contact failure of a connector or it may cause a malfunction, fire or electric shock due to static electricity.

**Caution****Do not use or place the product in the following locations.**

- Humid and dusty locations
- Airless locations such as closet or bookshelf
- Locations which receive oily smoke or steam
- Locations exposed to direct sunlight
- Locations close to heating equipment
- Closed inside of a car where the temperature becomes high
- Staticky locations
- Locations close to water or chemicals

Otherwise, a fire, electric shock, accident or deformation may occur due to a short circuit or heat generation.

**Do not place heavy things on the product.**

Otherwise, the product may be damaged.

■ Disclaimer

This product consists of two digital audio signal (75 ohm unbalanced) inputs through the pulse transformer and two digital audio signal (75 ohm unbalanced) outputs through the pulse transformer.

It provides Samtec's DIN connector and FMC connector (LPC) interfaces.

Tokyo Electron Device Limited assumes no responsibility for any damages resulting from the use of this product for purposes other than those stated.

Even if the product is used properly, Tokyo Electron Device Limited assumes no responsibility for any damages caused by:

- Earthquake, thunder, natural disaster or fire resulting from the use beyond our responsibility, acts by a third party or other accidents, the customer's willful or accidental misuse or use under other abnormal conditions,
- Secondary impact arising from use of this product or its unusable state (business interruption or others),
- Use of this product against the instructions given in this manual or
- Malfunctions due to connection to other devices.

Tokyo Electron Device Limited assumes no responsibility or liability for:

- Erasure or corruption of data arising from use of this product
- Any consequences or other abnormalities arising from use of this product, or
- Damage of this product not due to our responsibility or failure due to modification

This product has been developed by assuming its use for research, testing or evaluation. It is not authorized for use in any system or application that requires high reliability.

Repair of this product is carried out by replacing it on a chargeable basis, not repairing the faulty devices.

However, non-chargeable replacement is offered for initial failure if such notification is received within two weeks after delivery of the product.

The specification of this product is subject to change without prior notice.

The product is subject to discontinuation without prior notice.

1. Related Documents and Board Accessories

All documents relating to this board can be downloaded from our website Club-X.

[Accessories]

Board support spacer set

2. Overview

The TB-FMCL-AUDIO provides two input and two output ports that comply with the 75 ohm unbalanced digital audio standard (AES3id/SPDIF).

The input ports use Murata's digital audio transformer "DA101JC" and TI's differential bus transceiver "SN75176" and the output ports use Murata's digital audio transformer "DA101JC".

Additionally, Samtec DIN coaxial connectors "DIN7A-J-P-GFRA-BH1" are used for both input/output ports.

A Samtec FMC connector is used for connection with low-pin count platform boards.

3. Features

Digital audio 75-ohm transformer: Murata's DA101JC (initially, the board comes with DA101MC)

75-ohm coaxial connector: Samtec's DIN7A-J-P-GFRA-BH1

FMC connector: Samtec's ASP-134604-01

K	J	H	G	F	E	D	C	B	A
1	VREF_B M2C	GND	VREF_A M2C	GND	PG M2C	GND	PG C2M	GND	RES1
2	GND	CLK3 M2C P	PRSN1 M2C L	CLK1 M2C P	GND	HA01 P CC	GND	DP0 C2M P	GND
3	GND	CLK3 M2C N	GND	CLK1 M2C N	GND	HA01 N CC	GND	DP0 C2M N	GND
4	CLK2 M2C P	GND	CLK0 M2C P	GND	HA00 P CC	GND	GBTCLK0 M2C P	GND	DP9 M2C P
5	CLK2 M2C N	GND	CLK0 M2C N	GND	HA00 N CC	GND	GBTCLK0 M2C N	GND	DP9 M2C N
6	GND	HA03 P	GND	LA00 P CC	GND	HA05 P	GND	DP0 M2C P	GND
7	HA02 P	HA03 N	LA02 P	LA00 N CC	HA04 P	HA05 N	GND	DP0 M2C N	GND
8	HA02 N	GND	LA02 N	GND	HA04 N	GND	LA01 P CC	GND	DP8 M2C P
9	GND	HA07 P	GND	LA03 P	GND	HA09 P	LA01 N CC	GND	DP8 M2C N
10	HA06 P	HA07 N	LA04 P	LA03 N	HA08 P	HA09 N	GND	LA06 P	GND
11	HA06 N	GND	LA04 N	GND	HA08 N	GND	LA05 P	LA06 N	GND
12	GND	HA11 P	GND	LA08 P	GND	HA13 P	LA05 N	GND	DP7 M2C P
13	HA10 P	HA11 N	LA07 P	LA08 N	HA12 P	HA13 N	GND	GND	DP7 M2C N
14	HA10 N	GND	LA07 N	GND	HA12 N	GND	LA09 P	LA10 P	GND
15	GND	HA14 P	GND	LA12 P	GND	HA16 P	LA09 N	LA10 N	GND
16	HA17 P CC	HA14 N	LA11 P	LA12 N	HA15 P	HA16 N	GND	DP6 M2C P	GND
17	HA17 N CC	GND	LA11 N	GND	HA15 N	GND	LA13 P	GND	DP6 M2C N
18	GND	HA18 P	GND	LA16 P	GND	HA20 P	LA13 N	LA14 P	GND
19	HA21 P	HA18 N	LA15 P	LA16 N	HA19 P	HA20 N	GND	LA14 N	GND
20	HA21 N	GND	LA15 N	GND	HA19 N	GND	LA17 P CC	GND	DP5 M2C P
21	GND	HA22 P	GND	LA20 P	GND	HB03 P	LA17 N CC	GND	DP5 M2C N
22	HA23 P	HA22 N	LA19 P	LA20 N	HB02 P	HB03 N	GND	LA18 P CC	GND
23	HA23 N	GND	LA19 N	GND	HB02 N	HB03 N	GND	LA18 N CC	GND
24	GND	HB01 P	GND	LA22 P	GND	HB05 P	LA23 N	GND	DP9 C2M P
25	HB00 P CC	HB01 N	LA21 P	LA22 N	HB04 P	HB05 N	GND	GND	DP9 C2M N
26	HB00 N CC	GND	LA21 N	GND	HB04 N	GND	LA26 P	LA27 P	GND
27	GND	HB07 P	GND	LA25 P	GND	HB09 P	LA26 N	LA27 N	GND
28	HB06 P CC	HB07 N	LA24 P	LA25 N	HB08 P	HB09 N	GND	GND	DP8 C2M P
29	HB06 N CC	GND	LA24 N	GND	HB08 N	GND	TCK	GND	DP8 C2M N
30	GND	HB11 P	GND	LA29 P	GND	HB13 P	TDI	SCL	GND
31	HB10 P	HB11 N	LA28 P	LA29 N	HB12 P	HB13 N	TDO	SDA	GND
32	HB10 N	GND	LA28 N	GND	HB12 N	GND	3P3VALUX	GND	DP7 C2M P
33	GND	HB15 P	GND	LA31 P	GND	HB19 P	TMS	GND	DP7 C2M N
34	HB14 P	HB15 N	LA30 P	LA31 N	HB16 P	HB19 N	TRST_L	GA0	GND
35	HB14 N	GND	LA30 N	GND	HB16 N	GND	GA1	1200V	GND
36	GND	HB18 P	GND	LA33 P	GND	HB21 P	3P3V	GND	DP6 C2M P
37	HB17 P CC	HB18 N	LA32 P	LA33 N	HB20 P	HB21 N	GND	1200V	DP6 C2M N
38	HB17 N CC	GND	LA32 N	GND	HB20 N	GND	3P3V	GND	GND
39	GND	VIO_B M2C	GND	VADJ	GND	VADJ	GND	3P3V	GND
40	VIO_B M2C	GND	VADJ	GND	VADJ	GND	3P3V	GND	RES0

Figure 3-1 FMC Connector Pin Assignments

The FMC connector on this board can be connected only to the LPC connectors listed in the above table.

For information about actual pins, refer to Section 4.6.

4. TB-FMCL-AUDIO Description

4.1. Block Diagram

Figure 4-1 shows the TB-FMCL-AUDIO block diagram.

Initially, the board comes with a DA101MC having function and performance equivalent to DA101JC.

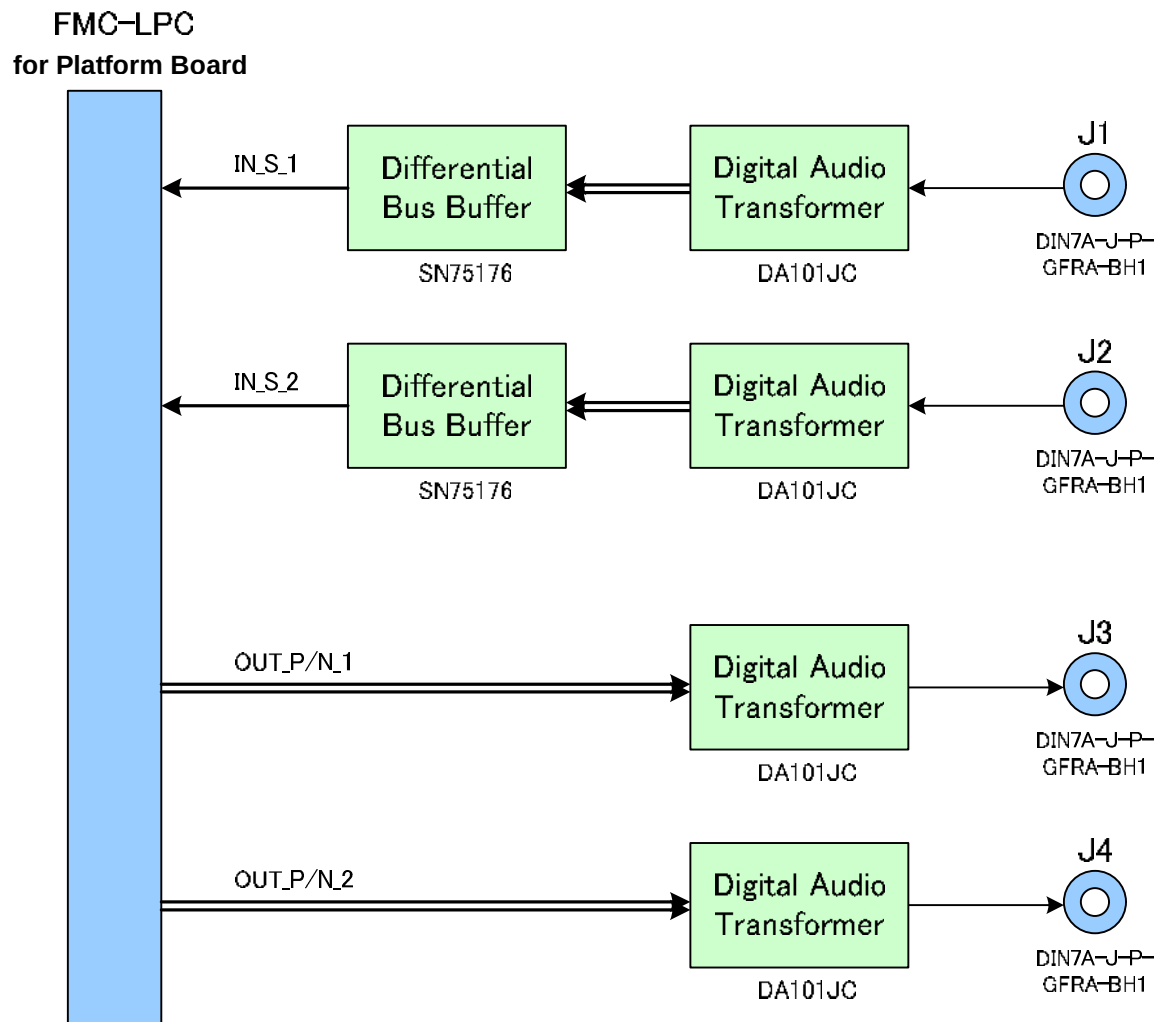


Figure 4-1 TB-FMCL-AUDIO Block Diagram

4.2. External View of the Board

Figure 4-2 and 4-3 show the external view of the TB-FMCL-AUDIO board.

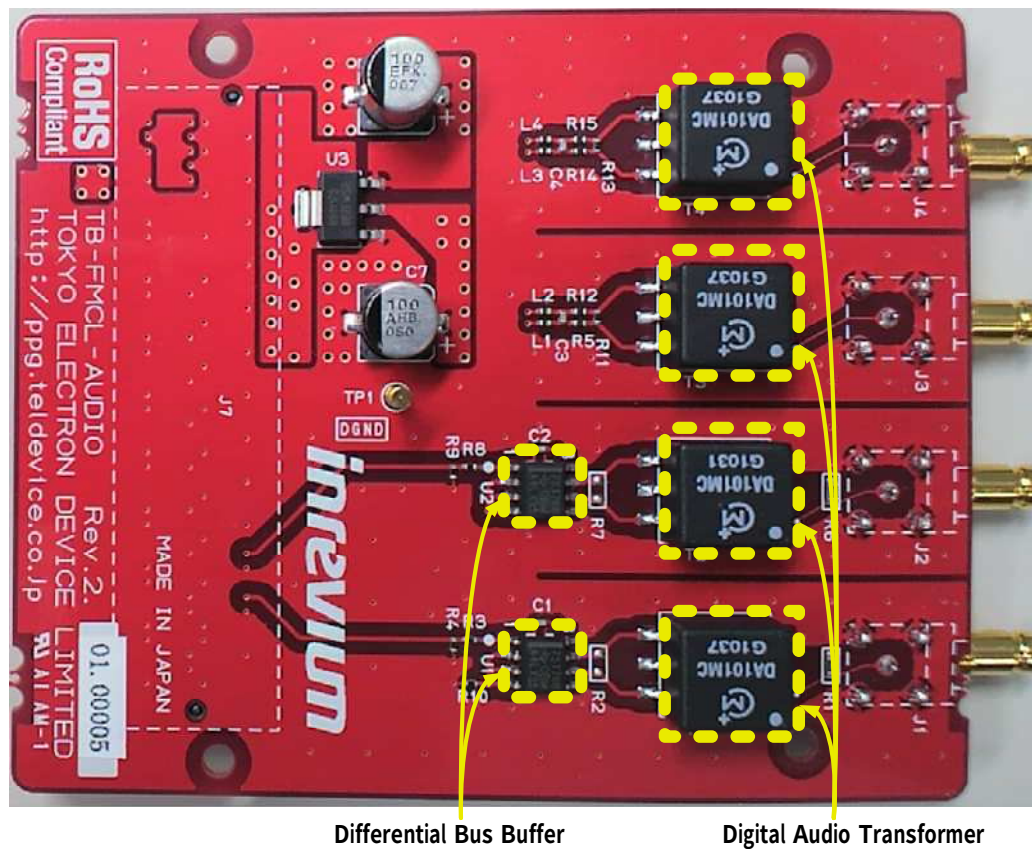


Figure 4-2 Component Side

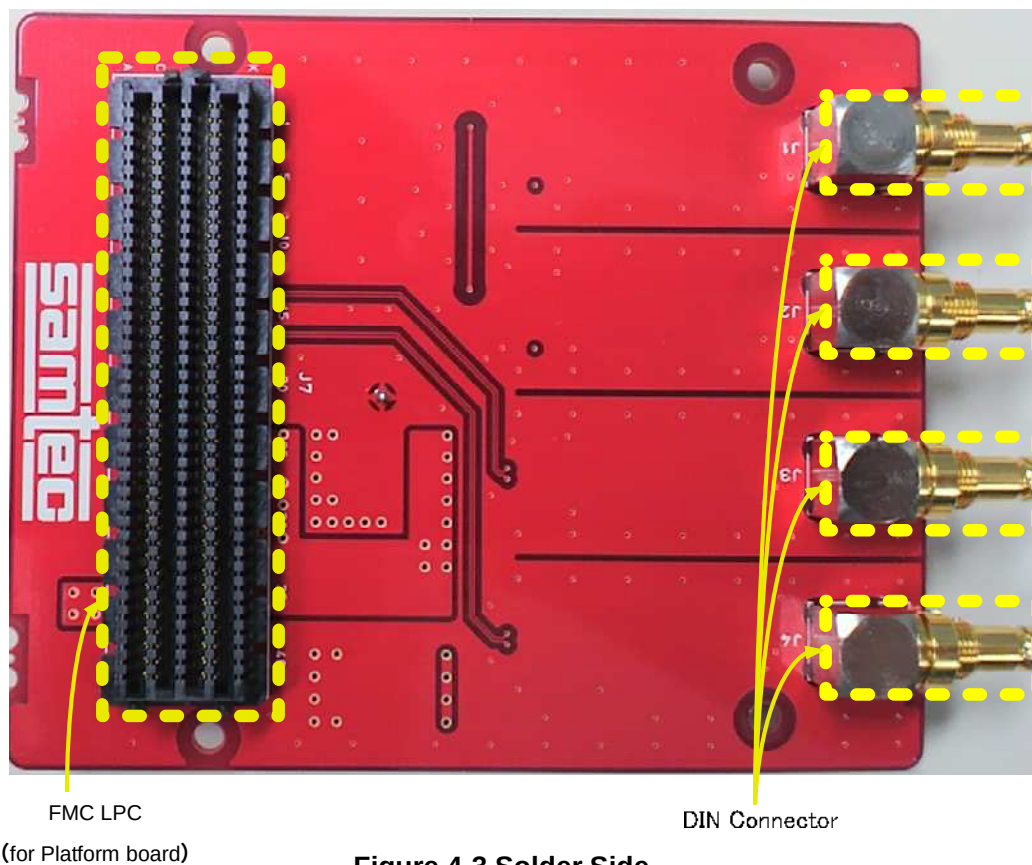


Figure 4-3 Solder Side

4.3. Board Specifications

Figure 4-4 shows the TB-FMCL-AUDIO board specifications.

External dimensions: W: 84 mm x H: 69 mm

Number of layers: 4

Board thickness: 1.6mm

Material: FR-4

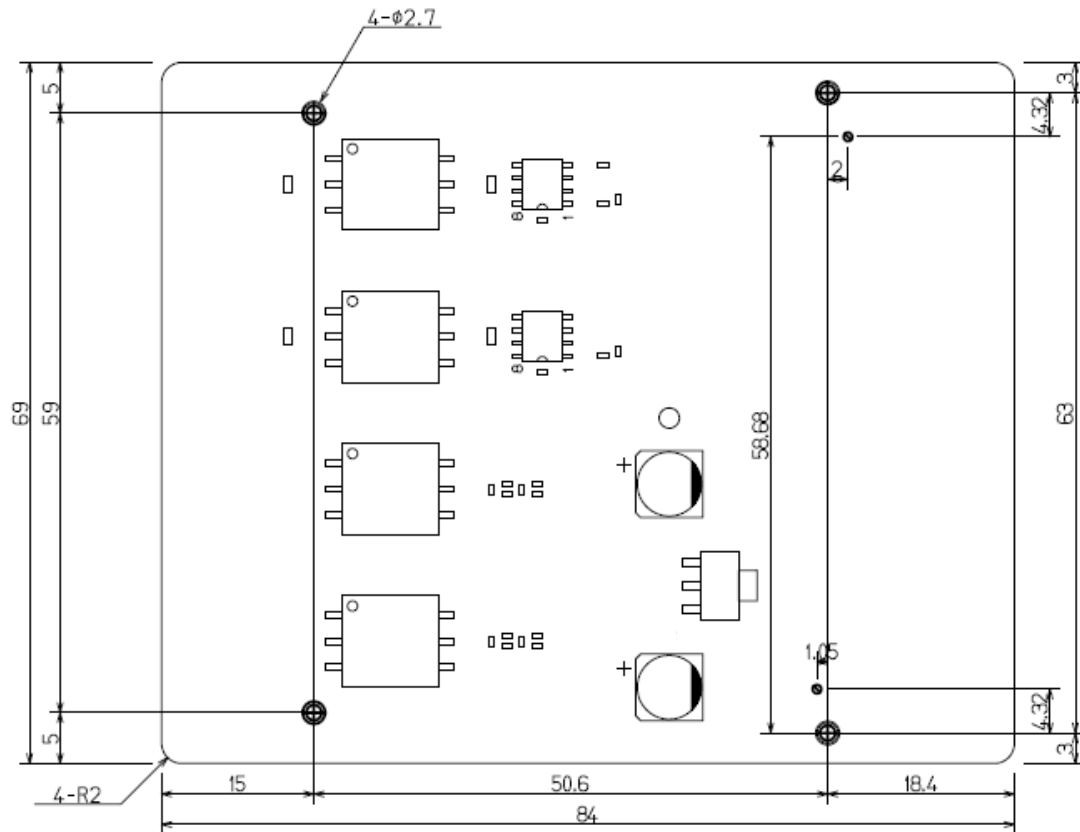


Figure 4-4 TB-FMCL-AUDIO Board Dimensions

4.4. Power Supply to the Board

Figure 4-5 shows the TB-FMCL-AUDIO power supply circuit diagram.

+5.0V is generated by the onboard TI LDO "REG1117-5" from +12V that is supplied through the FMC connector.

The TI differential bus transceiver "SN75176", which is used for level conversion of digital audio coaxial inputs, is designed to provide an output voltage of +2.5V amplitude to the platform board.

Therefore, the IO bank voltage (VCCO) of the FPGA on the platform board to be connected to the FMC connector of the TB-FMCL-AUDIO board must be +2.5V.

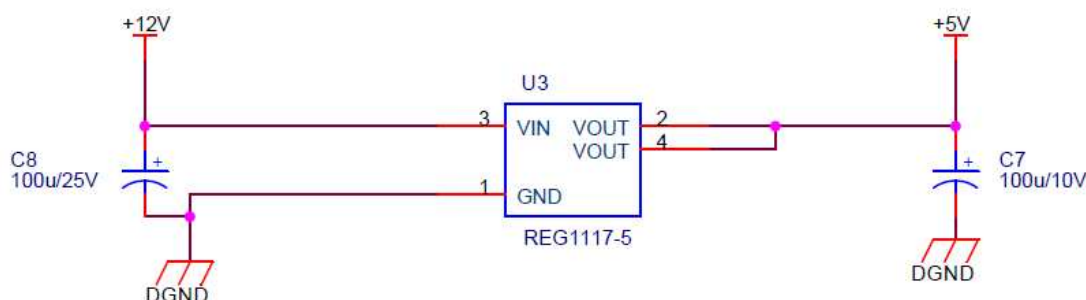


Figure 4-5 Power Supply Circuit

4.5. Coaxial Connector

The board uses a digital audio I/O coaxial connector "Samtec DIN7A-J-P-GFRA-BH1".

Table 4-1 shows the pin assignments of the coaxial connector.

Table 4-1 Coaxial Connector

Connector #	IC (Reference) Connected	Purpose
J1	DAC101JC (T1)	Digital audio input channel-0/1
J2	DAC101JC (T2)	Digital audio input channel-2/3
J3	DAC101JC (T3)	Digital audio output channel-0/1
J4	DAC101JC (T4)	Digital audio output channel-2/3

J1 and J2 are terminated with 75 ohms.

For conversion from DIN connector to BNC connector, use Samtec's DIN-BNC conversion cable "F179-74BJ3-78SP4-0300" (option).

4.6. FMC Connector for Connecting a Platform Board

The subsequent pages provide the FMC connector pin assignments for connection to the platform board.

The **I/O** field in the tables shows the I/O direction:

From "Platform Board" to "TB-FMCL-AUDIO" INPUT (I)

From "TB-FMCL-AUDIO" to "Platform Board" OUTPUT (O)

Table 4-2 FMC Connector Pin Assignments for Connecting a Platform Board

C-row (FMC connector for connecting a platform board)				
Pin#	FMC Standard	I/O	Signal Name	Description
1	GND	-	-	-
2	DP0_C2M_P	-	N/C	-
3	DP0_C2M_N	-	N/C	-
4	GND	-	-	-
5	GND	-	-	-
6	DP0_M2C_P	-	N/C	-
7	DP0_M2C_N	-	N/C	-
8	GND	-	-	-
9	GND	-	-	-
10	LA06_P	-	N/C	-
11	LA06_N	-	N/C	-
12	GND	-	-	-
13	GND	-	-	-
14	LA10_P	-	N/C	-
15	LA10_N	-	N/C	-
16	GND	-	-	-
17	GND	-	-	-
18	LA14_P	-	N/C	-
19	LA14_N	-	N/C	-
20	GND	-	-	-
21	GND	-	-	-
22	LA18_P_CC	-	N/C	-
23	LA18_N_CC	-	N/C	-
24	GND	-	-	-
25	GND	-	-	-
26	LA27_P	-	N/C	-
27	LA27_N	-	N/C	-
28	GND	-	-	-
29	GND	-	-	-
30	SCL	-	N/C	-
31	SDA	-	N/C	-
32	GND	-	-	-
33	GND	-	-	-
34	GA0	-	N/C	-
35	12P0V	-	+12V	+12V
36	GND	-	-	-
37	12P0V	-	+12V	+12V
38	GND	-	-	-
39	3P3V	-	N/C	-
40	GND	-	-	-

D-row (FMC connector for connecting a platform board)				
Pin#	FMC Standard	I/O	Signal Name	Description
1	PG_C2M	-	N/C	-
2	GND	-	-	-
3	GND	-	-	-
4	GBTCLK0_M2C_P	-	N/C	-
5	GBTCLK0_M2C_N	-	N/C	-
6	GND	-	-	-
7	GND	-	-	-
8	LA01_P_CC	-	N/C	-
9	LA01_N_CC	-	N/C	-
10	GND	-	-	-
11	LA05_P	-	N/C	-
12	LA05_N	-	N/C	-
13	GND	-	-	-
14	LA09_P	-	N/C	-
15	LA09_N	-	N/C	-
16	GND	-	-	-
17	LA13_P	-	N/C	-
18	LA13_N	-	N/C	-
19	GND	-	-	-
20	LA17_P_CC	-	N/C	-
21	LA17_N_CC	-	N/C	-
22	GND	-	-	-
23	LA23_P	-	N/C	-
24	LA23_N	-	N/C	-
25	GND	-	-	-
26	LA26_P	-	N/C	-
27	LA26_N	-	N/C	-
28	GND	-	-	-
29	TCK	-	N/C	-
30	TDI	-	N/C	-
31	TDO	-	N/C	-
32	3P3VAUX	-	N/C	-
33	TMS	-	N/C	-
34	TRST_L	-	N/C	-
35	GA1	-	N/C	-
36	3P3V	-	N/C	-
37	GND	-	-	-
38	3P3V	-	N/C	-
39	GND	-	-	-
40	3P3V	-	N/C	-

G-row (FMC connector for connecting a platform board)				
Pin#	FMC Standard	I/O	Signal Name	Description
1	GND	-	-	-
2	CLK0_M2C_P	-	N/C	-
3	CLK0_M2C_N	-	N/C	-
4	GND	-	-	-
5	GND	-	-	-
6	LA00_P_CC	-	N/C	-
7	LA00_N_CC	-	N/C	-
8	GND	-	-	-
9	LA03_P	-	N/C	-
10	LA03_N	-	N/C	-
11	GND	-	-	-
12	LA08_P	-	N/C	-
13	LA08_N	-	N/C	-
14	GND	-	-	-
15	LA12_P	-	N/C	-
16	LA12_N	-	N/C	-
17	GND	-	-	-
18	LA16_P	-	N/C	-
19	LA16_N	-	N/C	-
20	GND	-	-	-
21	LA20_P	-	N/C	-
22	LA20_N	-	N/C	-
23	GND	-	-	-
24	LA22_P	-	N/C	-
25	LA22_N	-	N/C	-
26	GND	-	-	-
27	LA25_P	-	N/C	-
28	LA25_N	-	N/C	-
29	GND	-	-	-
30	LA29_P	-	N/C	-
31	LA29_N	-	N/C	-
32	GND	-	-	-
33	LA31_P	-	N/C	-
34	LA31_N	-	N/C	-
35	GND	-	-	-
36	LA33_P	-	N/C	-
37	LA33_N	-	N/C	-
38	GND	-	-	-
39	VADJ	-	N/C	-
40	GND	-	-	-

H-row (FMC connector for connecting a platform board)				
Pin#	FMC Standard	I/O	Signal Name	Description
1	VREF_A_M2C	-	N/C	-
2	PRSNT_M2C_L	-	N/C	-
3	GND	-	-	-
4	CLK0_M2C_P	-	N/C	-
5	CLK0_M2C_N	-	N/C	-
6	GND	-	-	-
7	LA02_P	O	IN_S_1	Digital audio input channel-0/1 (single end)
8	LA02_N	-	N/C	-
9	GND	-	-	-
10	LA04_P	O	IN_S_2	Digital audio input channel-2/3 (single end)
11	LA04_N	-	N/C	-
12	GND	-	-	-
13	LA07_P	I	OUT_P_1	Digital audio output channel-0/1 (Positive)
14	LA07_N	I	OUT_N_1	Digital audio output channel-0/1 (Negative)
15	GND	-	-	-
16	LA11_P	I	OUT_P_2	Digital audio output channel-2/3 (Positive)
17	LA11_N	I	OUT_N_2	Digital audio output channel-2/3 (Negative)
18	GND	-	-	-
19	LA15_P	-	N/C	-
20	LA15_N	-	N/C	-
21	GND	-	-	-
22	LA19_P	-	N/C	-
23	LA19_N	-	N/C	-
24	GND	-	-	-
25	LA21_P	-	N/C	-
26	LA21_N	-	N/C	-
27	GND	-	-	-
28	LA24_P	-	N/C	-
29	LA24_N	-	N/C	-
30	GND	-	-	-
31	LA28_P	-	N/C	-
32	LA28_N	-	N/C	-
33	GND	-	-	-
34	LA30_P	-	N/C	-
35	LA30_N	-	N/C	-
36	GND	-	-	-
37	LA32_P	-	N/C	-
38	LA32_N	-	N/C	-
39	GND	-	-	-
40	VADJ	-	N/C	-



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